T3/Oat tutorials

Tutorial 7: T3 and the Android Field Book

https://triticeaetoolbox.org/oat/

The Android Field Book

The Android Field Book program was created by the Poland lab (Kansas State University). The program can be downloaded from:

http://www.wheatgenetics.org/bioinformatics/22-android-field-book.html

Wheat Genetics and Germplasm Improvement

Field Book

Field Book is one of the apps developed for the One Handheld Per Breeder initiative. Field Book is a simple app that can be used by researchers to easily take notes on field research plots. Other digital note-taking tools are often complex spreadsheet applications that don't allow for fast and flexible data entry or are created for proprietary and expensive hardware which is inaccessible for many research groups.

Using open-source software and relatively inexpensive phone and tablet hardware, we have created a platform that will allow researchers to replace hard-copy field books, thus alleviating the possibility of transcription errors. Creating this system also allows useful and modern technology to be used in environments where cost and inflexibility have been limiting factors.
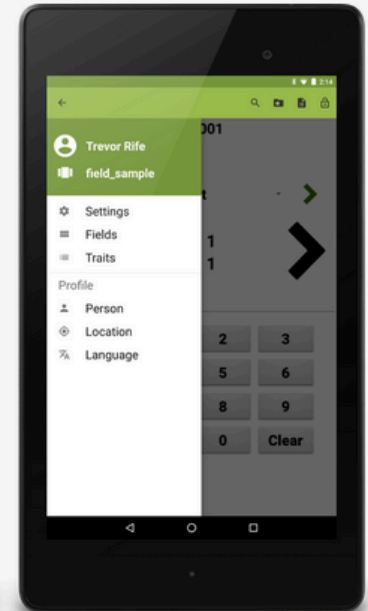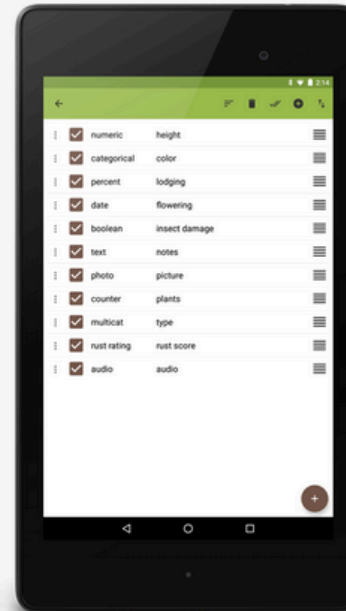
T3 and the Android Field Book

T3 provides a series of tools that interface with the Android Field Book (AFB) program:

- T3 tools can be used to generate
  - A field layout file
  - A phenotypic trait file

  These two files are required to begin recording measurements using the AFB

- Trial results recorded in the AFB can be uploaded directly to T3

T3 and the Android Field Book app

How to begin recording results using the AFB and T3:

1. Create a trial in T3 (or use an existing T3 trial)
2. Create a field layout for the T3 trial
3. Download a field layout from T3 in the AFB format
4. Download a file of T3 traits in the AFB format
5. Import the field layout and trait file to the AFB app
6. Begin recording results using your tablet

Tutorial 7: Outline

1. The "Manage Phenotype Trials" tool
   1. Creating and uploading a new T3 trial
   2. Creating a T3 field layout
   3. Uploading a T3 field layout to the T3/Oat Sandbox
2. Downloading AFB files from the T3/Oat Sandbox
3. Importing files to the AFB
4. Recording measurements in the AFB
5. Exporting trial results from the AFB
6. Uploading AFB trial results to the T3/Oat Sandbox
7. Submitting the AFB trial to T3/Oat

Section 1: The "Manage Phenotype Trials" tool

- Navigate to the T3/Oat homepage at https://triticeaetoolbox.org/oat/
- The "Manage Phenotype Trials" tool can be used to:
  - Create a new T3 trial
  - Create a field layout for a new or an existing T3 trial

Section 1.1: Creating and uploading a new T3 trial

It is necessary to provide trial information before a field layout can be generated using T3 tools. This trial information is not used by the AFB app.

To create a new T3 trial using the "Manage Phenotype Trials" tool:

- First select the set of lines in the trial using one of the line selection tools
- Then navigate to the Manage menu> Phenotype Trials

Section 1.1: Creating and uploading a new T3 trial

Manage Phenotype trials

This tool allows you to view a trial, create a trial, or create an experiment design.
The results can be uploaded in the sandbox, downloaded to a tablet device, or submitted to the curator for loading into the production website.

1

○ Select existing trial
● Create new trial

The trial design is generated by the agricolae package except for the Mod. Aug. Design type which uses a custom R script.
To create an experiment design, select a design type from the drop-down list

Program:	select program	Program responsible for data collection
Trial Name:		Format: "Experiment_YYYY_Location", where Experiment is short but descriptive, YYYY=Trial Year. Trial Names should be unique across T3 for a crop. A trial is carried out at one location in one year.
Year:	2015	
Location:	select location	
Experiment Name:		Optional. The experiment is one hierarchical level above the trial. An experiment may have several trials with similar or identical entry lists
Latitude of field:		Decimal Degrees format, without a degree symbol, e.g. "47.824". There is a converter at http://boulter.com/gps/. GPS coordinates can be found by address at http://itouchmap.com/latlong.html.
Longitude of field:		
Collaborator:		Name of principal scientist.
Trial description:		
Planting date:		This should be the one date on which planting was begun. Use Excel "Text", not "Date", format. The value should be given as m/d/yyyy with no leading zeros, e.g. "5/7/2012".
Harvest date:		Use Excel "Text", not "Date", format. if the trial was not harvested, use the date of last data collection.
Begin weather date:		Optional, if T3 should store weather data starting at some point before planting (e.g., to track soil moisture status).
Greenhouse trial	● No ○ Yes	
Seeding rate		This is the target density for the trial, not the actual rate for each line
Design type:	select design	
Irrigation	● No ○ Yes	
Other remarks		Optional. Adjustments to means in data analysis or other specifics of statistical analysis. Other notes that may help in interpretation of results, for example that harvest was delayed due to weather.

Create trial

2

3

*

To create a new T3 trial:

1. Select "Create new trial" at the top of the page

2. Fill out the form
    –   Please contact the curator if you do not see the value that you require in a drop-down menu

* If you select an experimental design then you can create and download a field layout at this stage (see section 1.2)

3. Click "Create trial"

4. Download the trial description

5. Upload the trial description to the T3/Oat Sandbox at https://t3sandbox.org/t3/sandbox/oat/

Section 1.1: Creating and uploading a new T3 trial

- The trial description file generated by the "Manage Phenotype Trials" tool is in the format required for upload to T3
- Alternatively, a trial description template (below) can be used to upload trial information for one or more trials, or to edit existing trial information
  - The template is available from the Data Submission page in the About T3 menu
- See T3 Tutorial 3 for help loading trial information to the T3/Oat Sandbox (https://t3sandbox.org/t3/sandbox/oat/)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	**Trial Submission Form**														
2	Template version	4Dec12													
3	Crop	oat													
4	Breeding Program Code	CDC-D													
5		**TRIAL #1**	**TRIAL #2**												
6	Trial Name	UEOPN_2015_Saskatoon	UEOPN_2014_Saskatoon												
7	Trial Year	2015	2014												
8	Experiment Name	Uniform Early Oat Perform	Uniform Early Oat Performance Nursery												
9	Location	Saskatoon, SK-CAN	Saskatoon, SK-CAN												
10	Latitude of field	52.153467	52.146691												
11	Longitude of field	-106.528719	-106.540644												
12	Collaborator	Aaron D. Beattie	Aaron D. Beattie												
13	Trial description														
14	Planting date	5/18/2015	5/17/2014												
15	Harvest date	9/21/2015	9/1/2014												
16	Begin weather date														
17	Greenhouse trial? (yes or no)	no	no												
18	Seeding rate (seeds/m^2)	254	254												
19	Experimental design	RCBD	RCBD												
20	Number of entries	24	23												
21	Number of replications	3	3												

Notes

Row headings with a green background show the required fields. Required fields also have an asterisk (*) in these notes.

***Breeding Program Code**: Program responsible for data collection. Codes can be found under the About T3 menu> Contributing data programs. Data program codes are located in the second table under the heading 'Data programs' and consist of a 3-letter code followed by "-D". All of the trials loaded in the same Trial Submission document must have the same breeding program code.

***Trial Name**: Format is "Experiment_YYYY_Location". You are free to choose an experiment name, which should be short but descriptive, and can be used as an additional method of linking trials together later in the form. YYYY= trial year; for winter trials that are planted and harvested in different calendar years please use the year that the trial was harvested. Location= specific location of the trial, usually a nearby settlement. The trial name in its entirety should be unique.

***Trial Year**: Year in which the trial was or would have been harvested.

Experiment Name: Experiment is one hierarchical level above trial and can be used to link trials in T3/Oat. The drop down menu "Search Trials by Experiment" on the T3/Oat homepage can be used to view existing experiments. Experiment name should be self-explanatory but it can be coded when used as part of a trial name (see examples in this template).

***Location**: Format for USA and Canada is <city/town>, <2 letter state/province abbreviation> followed by "-CAN" or "-USA". Format for trials conducted in other countries is <city/town>, <country>.

***Latitude and Longitude of field**: Decimal degrees format without a degree symbol. There is a

Section 1.2: Creating a T3 field layout

A field layout for a new T3 trial can be created at the same time as the trial description (see section 1.1) using the "Manage Phenotype Trials" tool.

1. Select an experimental design
2. Depending on the design selection you will be prompted to specify:
   – The number of replicates
   – The block size
   – The checks
3. Click "Create field layout"
4. Download the field layout

The field layout for a new T3 trial will use the lines in the "current selections".

Section 1.2: Creating a T3 field layout

Manage Phenotype trials

This tool allows you to view a trial, create a trial, or create an experiment design.
The results can be uploaded in the sandbox, downloaded to a tablet device, or submitted to the curator for loading into the production website.

1 →

○ Select existing trial
○ Create new trial

To create an experiment design, select a design type from the drop-down list

2 →
3 →

Program:	AAFC Ottawa: data (OTW-D)
Trial Name:	UMOPN_2015_Ottawa
Year:	2015
Location:	Ottawa, ON-CAN
Experiment Name:	Uniform Midseason Oat Performance Nursery
Latitude of field:	
Longitude of field:	
Collaborator:	Weikai Yan
Trial description:	
Planting date:	2015-05-05
Greenhouse trial?	no
Seeding rate:	
Design type:	Random Complete Block
Irrigation:	
Other remarks:	The growing season was somewhat normal before heading and slightly drier than normal after the start of grain-filling. There was no lodging at all although the plant height was about normal. Stem breaking did occur after maturity for early varieties. The previous two crops were white clover and soybean, and the soil was clay-loam. N was applied pre-seeding at 25 lb per hectare; Buctril M was the herbicide sprayed at the 4-leaf stage. Crown rust was moderate with the really susceptible varieties heavily infested. Grain yield was originally recorded in bu/a and the original data is available in the supplementary raw data file. Plant height was originally recorded in inches and the original data is available in the supplementary data file. Test weight was originally recorded in lb/bu and the original data is available in the supplementary raw data file.

4 →

Field layout

Treatment:	30 lines selected
Replications or Blocks:	[ ] greater than or equal to 2

5 →

6 → Create field layout

To create a field layout for an existing T3 trial:

1. Choose "Select existing trial" at the top of the page
2. Select the breeding program responsible
3. Select the trial name
4. Choose an experimental design
5. Depending on the design selection you will be prompted to specify:
   – The number of replicates
   – The block size
   – The checks
6. Click "Create field layout"
7. Download the field layout

The field layout for an existing T3 trial will use the lines in the "current selections", unless the trial already has trial results stored in T3.

Section 1.2: Creating a T3 field layout

- The field layout file generated by the "Manage Phenotype Trials" tool is in the format required for upload to T3
  - This is not the same as the Android Field Book format
- Alternatively, the Fieldbook template (below) can be used to upload a field layout
  - The template is available from the Data Submission page in the About T3 menu
- **It is necessary to supplement the information held in a field layout generated using the "Manage Phenotype Trials" tool before uploading it to T3**
  - The "row" and "column" fields are required but are not filled in by the T3 tool
  - Please follow the instructions in the Fieldbook template if you wish to fill in the remaining optional fields

	plot	trial	line_name	row	column	entry	replication	block	subblock	treatment	block_tmt	subblock_tmt	check	Field_ID	note	
1	plot	trial	line_name	row	column	entry	replication	block	subblock	treatment	block_tmt	subblock_tmt	check	Field_ID	note	Mandatory fields are in
2	1	NUE_2012_MEAD	SETTLER_CL	1	1	302	1	1	1		LOW_N		1	MEAD12_1		trial (valid T3 trial name
3	2	NUE_2012_MEAD	TRIUMPH64	1	2	1	1	1	1		LOW_N		0	MEAD12_1		the field template. Ther
4	3	NUE_2012_MEAD	CHISHOLM	1	3	2	1	1	1		LOW_N		0	MEAD12_1		plot (numeric) [MANDA
5	4	NUE_2012_MEAD	CENTURY	1	4	3	1	1	1		LOW_N		0	MEAD12_1		separate rows. This mea
6	5	NUE_2012_MEAD	CUSTER	1	5	4	1	1	1		LOW_N		0	MEAD12_1		line_name (valid T3 line
7	6	NUE_2012_MEAD	2174-05	1	6	5	1	1	1		LOW_N		0	MEAD12_1		template file. The value
8	7	NUE_2012_MEAD	INTRADA	1	7	6	1	1	1		LOW_N		0	MEAD12_1		row (numeric): One dim
9	8	NUE_2012_MEAD	OK101	1	8	7	1	1	1		LOW_N		0	MEAD12_1		spatial variation along t
10	9	NUE_2012_MEAD	OK102	1	9	8	1	1	1		LOW_N		0	MEAD12_1		of the planter while it is
11	10	NUE_2012_MEAD	ENDURANCE	1	10	9	1	1	1		LOW_N		0	MEAD12_1		column (numeric): The o
12	11	NUE_2012_MEAD	DELIVER	1	11	10	1	1	1		LOW_N		0	MEAD12_1		control for spatial variat
13	12	NUE_2012_MEAD	OK_BULLET	1	12	11	1	1	1		LOW_N		0	MEAD12_1		movement of the plante
14	13	NUE_2012_MEAD	CENTERFIELD	1	13	12	1	1	1		LOW_N		0	MEAD12_1		entry (numeric): entry r
15	14	NUE_2012_MEAD	GUYMON	1	14	13	1	1	1		LOW_N		0	MEAD12_1		replication (numeric): If
16	15	NUE_2012_MEAD	DUSTER	1	15	14	1	1	1		LOW_N		0	MEAD12_1		the trial are grouped top
17	16	NUE_2012_MEAD	JAGGER	1	16	301	1	1	1		LOW_N		1	MEAD12_1		block (numeric): If prese
18	17	NUE_2012_MEAD	OK_RISING	1	17	15	1	1	1		LOW_N		0	MEAD12_1		seek to control for varia
19	18	NUE_2012_MEAD	OK02405	1	18	16	1	1	1		LOW_N		0	MEAD12_1		subblock (numeric): If p
20	19	NUE_2012_MEAD	PETE	1	19	17	1	1	1		LOW_N		0	MEAD12_1		trial are grouped togeth
21	20	NUE_2012_MEAD	BILLINGS	1	20	18	1	1	1		LOW_N		0	MEAD12_1		treatment (alphanumer
22	21	NUE_2012_MEAD	OK04505	1	21	19	1	1	1		LOW_N		0	MEAD12_1		might have different tre
23	22	NUE_2012_MEAD	OK04525	1	22	20	1	1	1		LOW_N		0	MEAD12_1		main_plot_tmt (alphan
24	221	NUE_2012_MEAD	SETTLER_CL	1	23	302	1	1	11		LOW_N		1	MEAD12_1		have the same level for

Text in column P (partial):

Mandatory fields are in

trial (valid T3 trial name the field template. Ther

plot (numeric) [MANDA separate rows. This mea

line_name (valid T3 line template file. The value

row (numeric): One dim spatial variation along t of the planter while it is

column (numeric): The o control for spatial variat movement of the plante

entry (numeric): entry r

replication (numeric): If the trial are grouped top

block (numeric): If prese seek to control for varia

subblock (numeric): If p trial are grouped togeth

treatment (alphanumer might have different tre

main_plot_tmt (alphan have the same level for blocks).

subplot_tmt (alphanum

check (0 or 1): 0 means

Section 1.3: Uploading a T3 field layout to the T3/Oat Sandbox

- Navigate to the T3/Oat Sandbox at https://t3sandbox.org/t3/sandbox/oat/
- The curation menu will appear once you register and login
- Choose the Curate menu> Phenotype Trials

Section 1.3: Uploading a T3 field layout to the T3/Oat Sandbox

The sandbox allows you to test load your template. The T3/Oat Sandbox reverts to an exact copy of T3/Oat overnight.
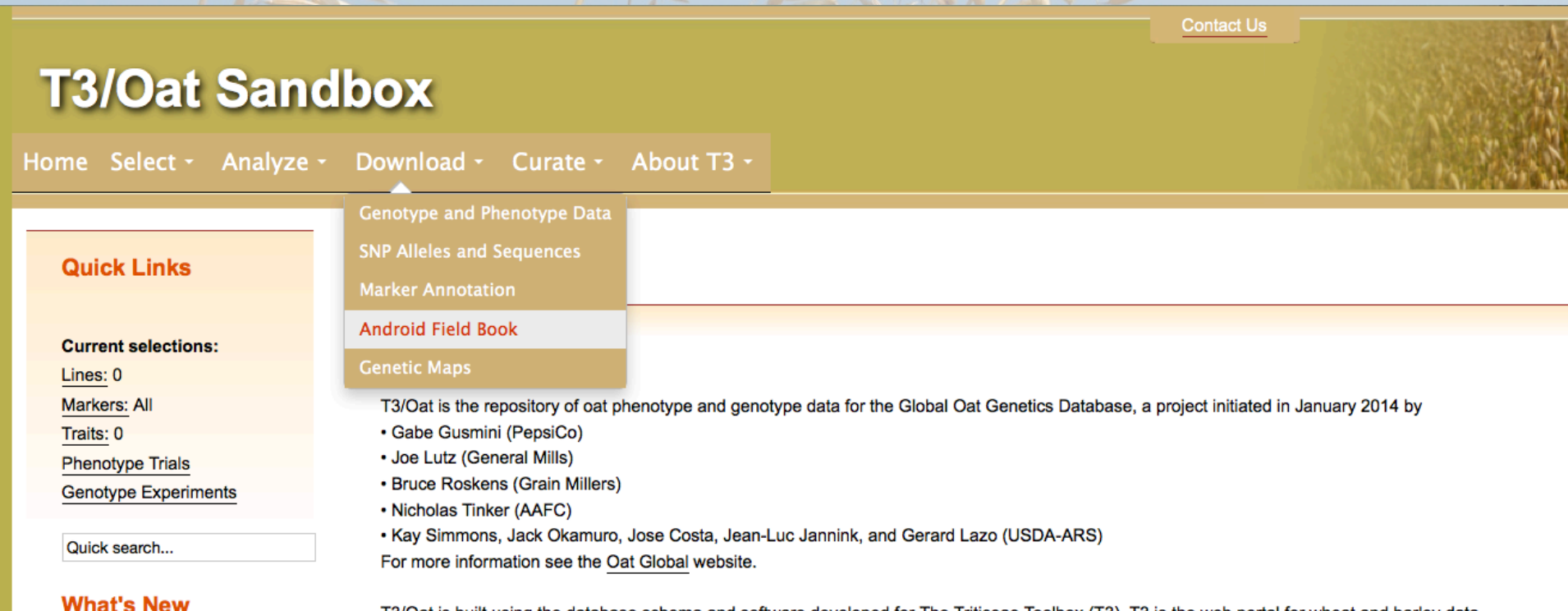
Browse for and upload the field layout file, created using either:
- The "Manage Phenotype Trials" tool
- The field layout template

Section 2: Downloading Android Field Book files from the T3/Oat Sandbox

- You should now have loaded a trial description and a field layout to the T3/Oat Sandbox
  - If you have not yet submitted these files to the production version of T3/Oat then the next step should be carried out in the T3/Oat Sandbox
- Choose the Download menu> Android Field Book

Section 2: Downloading Android Field Book files from the T3/Oat Sandbox

Download field layout and trait definition for Android Field Book

These tools provide a interface to the Android Field Book program created by the Poland Lab. Before using these tools it is necessary to import a field layout into the database. In the Field Book program the range is the first level division and refers to the row of the field. The second level division is the plot. All other columns are considered Extra Information. The program moves through the field row by row for measurements.

Create Field Layout and Trait File for import into the tablet

1. Select a field layout for your experiment. Download and save the file.
2. Select a category and one or more traits. Download and save the file.
3. Connect your tablet to this computer.
4. Move the field layout file to the field_import folder of the SD card of the tablet.
5. Move the trait file to the trait folder of the SD card of the tablet.
6. Import these files into the Field Book App.
7. Record measurements using the tablet.

Field layout:

select a fieldbook

Category

Abiotic stress
Agronomic
Biotic stress
End use
Morphological
Quality

Field layout: Download

UMOPN_2015_Saskatoon

Download

Category	Traits
Abiotic stress	heading date
Agronomic	lodging incidence
Biotic stress	grain yield
End use	plant height
Morphological	maturity date
Quality	groat content
	lodging severity
	snapback
	relative canopy development

Select the required field layout from the drop-down menu.

To download T3 traits:
1. Choose a trait category
2. Select one or more traits
   – Hold Ctrl (PC) or ⌘ (Mac)
3. Click "Download"

Navigate to the About T3 menu> Trait Descriptions for more details about the traits available in T3/Oat.

Section 3: Importing files to the Android Field Book

- Connect your tablet to your computer
- Move the two files downloaded from T3/Oat into the Android Field Book folder on your tablet
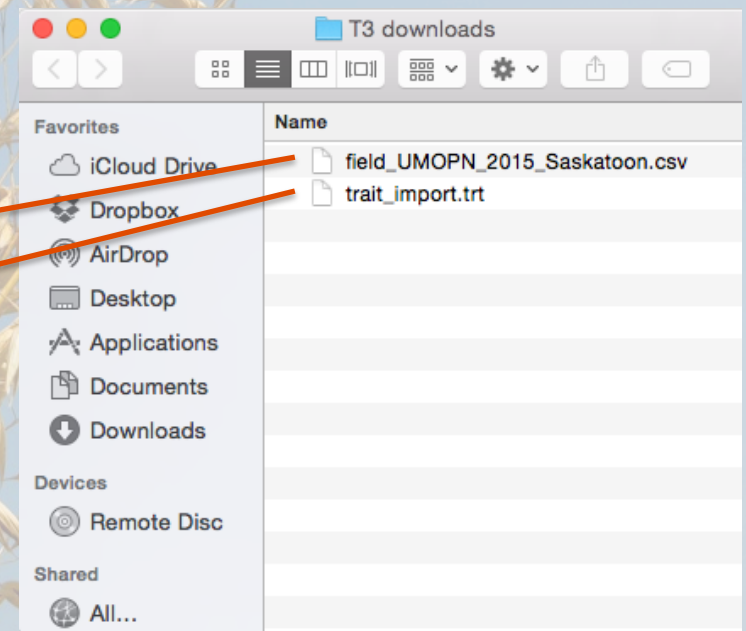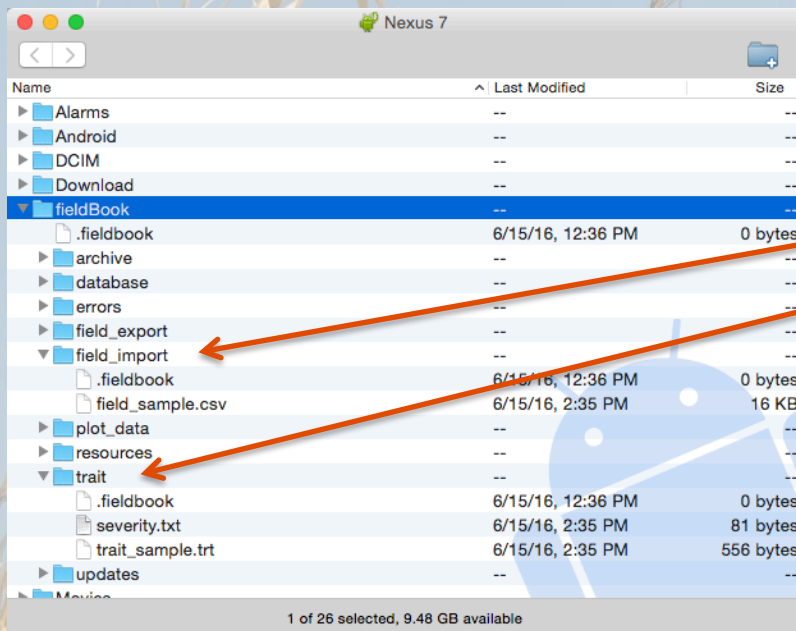
The Android File Transfer program for Mac (other methods of loading the files to the AFB are available)

A folder containing the field layout and the file of T3 traits downloaded from T3/Oat in sections 1 & 2 of this tutorial

Section 3: Importing files to the Android Field Book
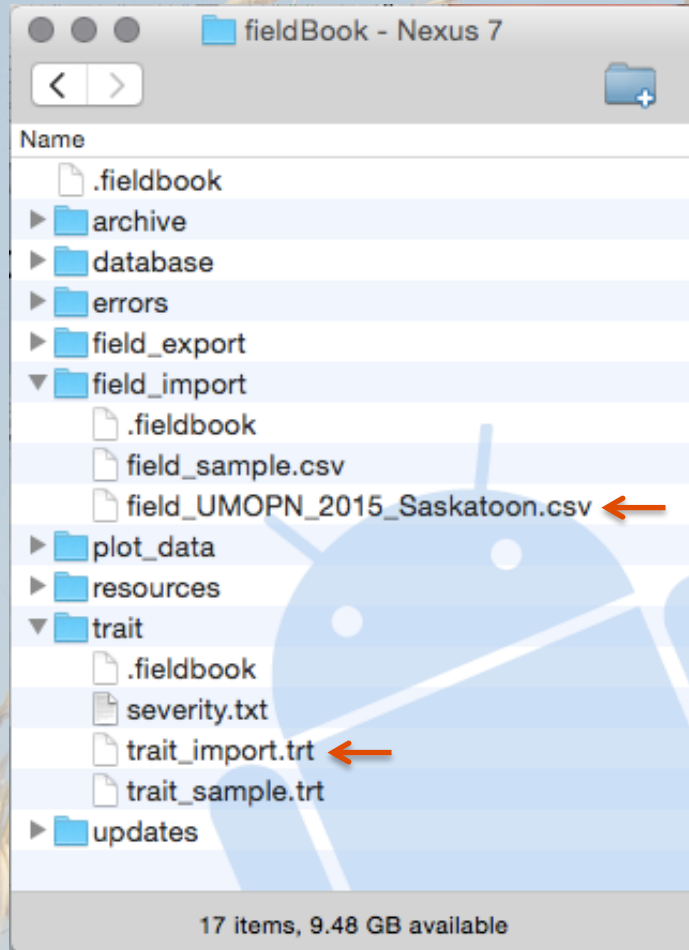
- The field layout should be placed in the folder called "field_import"

- The file of T3 traits should be placed in the folder called "trait"

These two files enable you to begin recording results using the AFB app.

Fields

Traits

Profile

Export

Advanced

Language
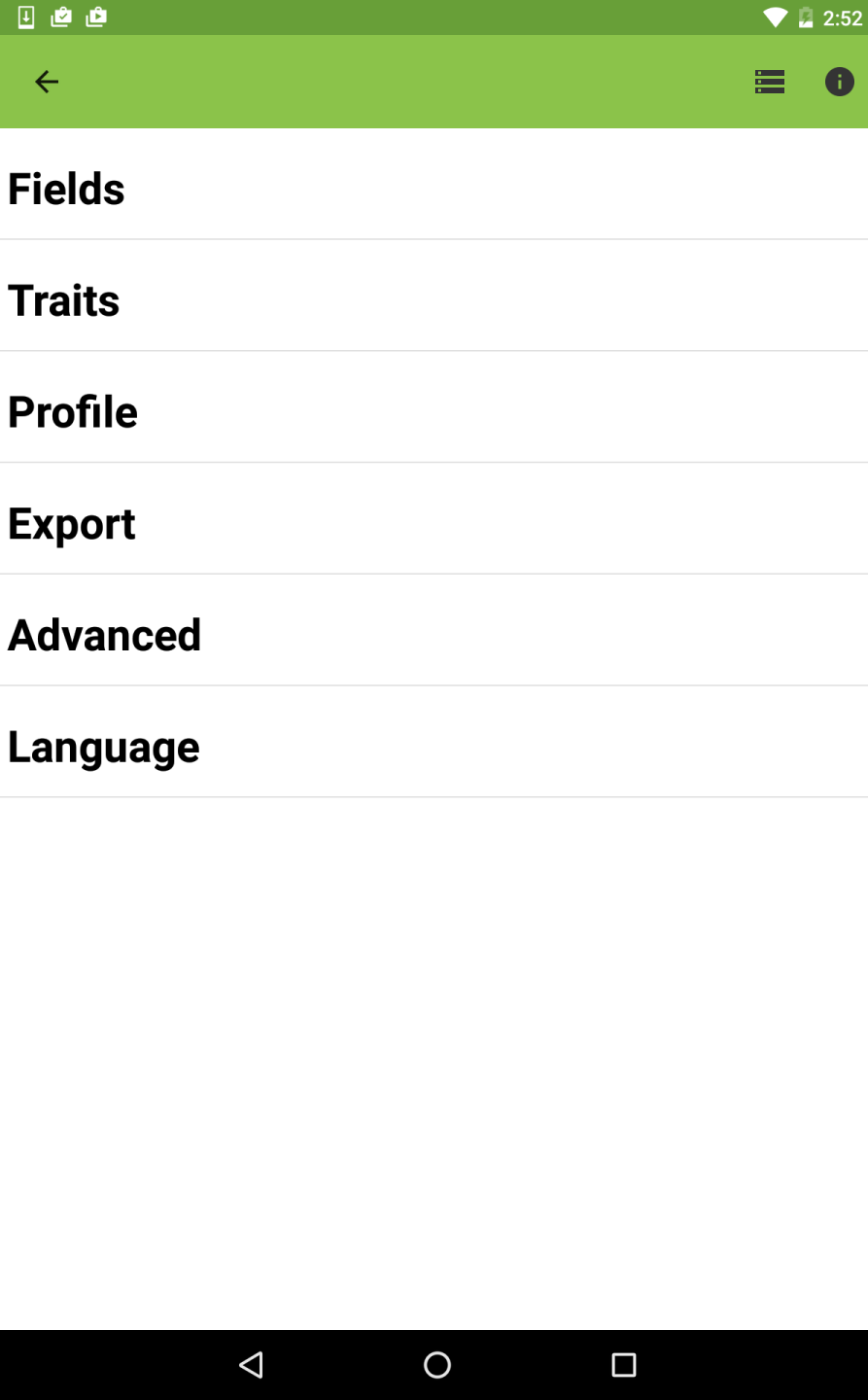
Section 3: Importing files to the Android Field Book

To begin using the AFB app you must first load the field layout and the trait file in the app

- Open the AFB app on your tablet
- Navigate to the settings menu
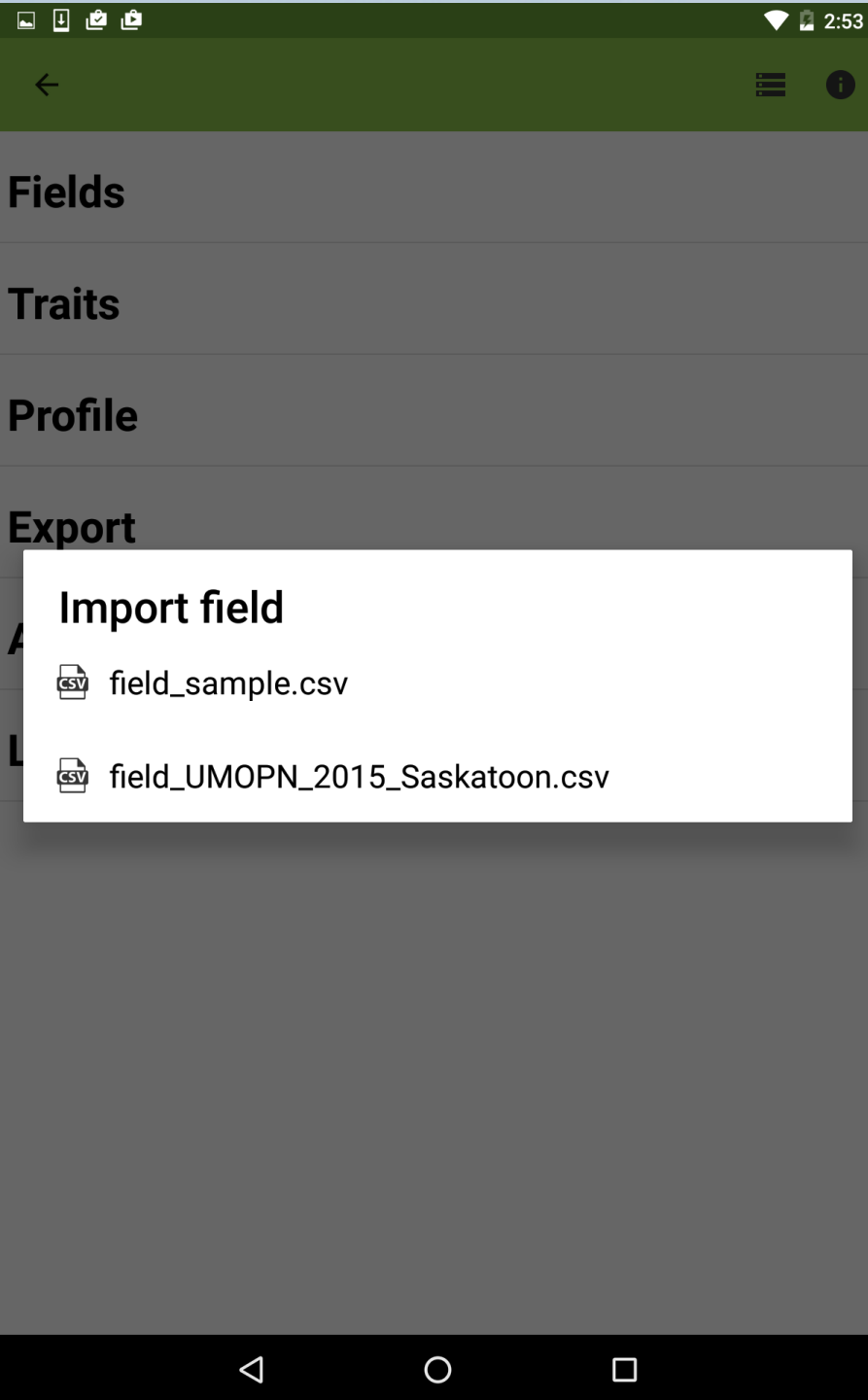
Section 3: Importing files to the Android Field Book

To load the field layout:

- Select "Fields" from the settings menu

- Select the relevant field layout file from the "Import field" window
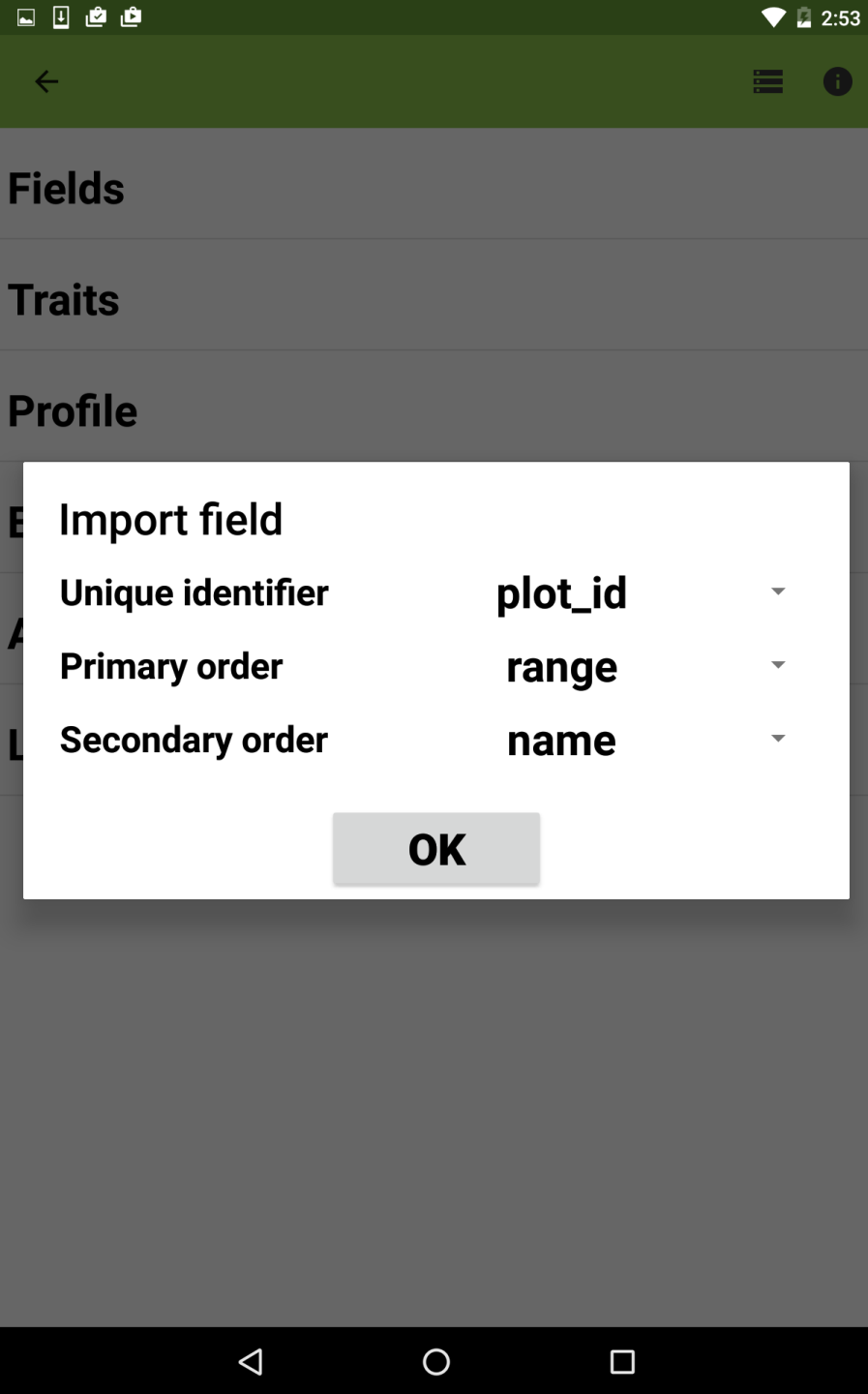
Section 3: Importing files to the Android Field Book

- Select the plot_id as the unique identifier
- Choose which fields to use for the primary and secondary order
- Click "OK"
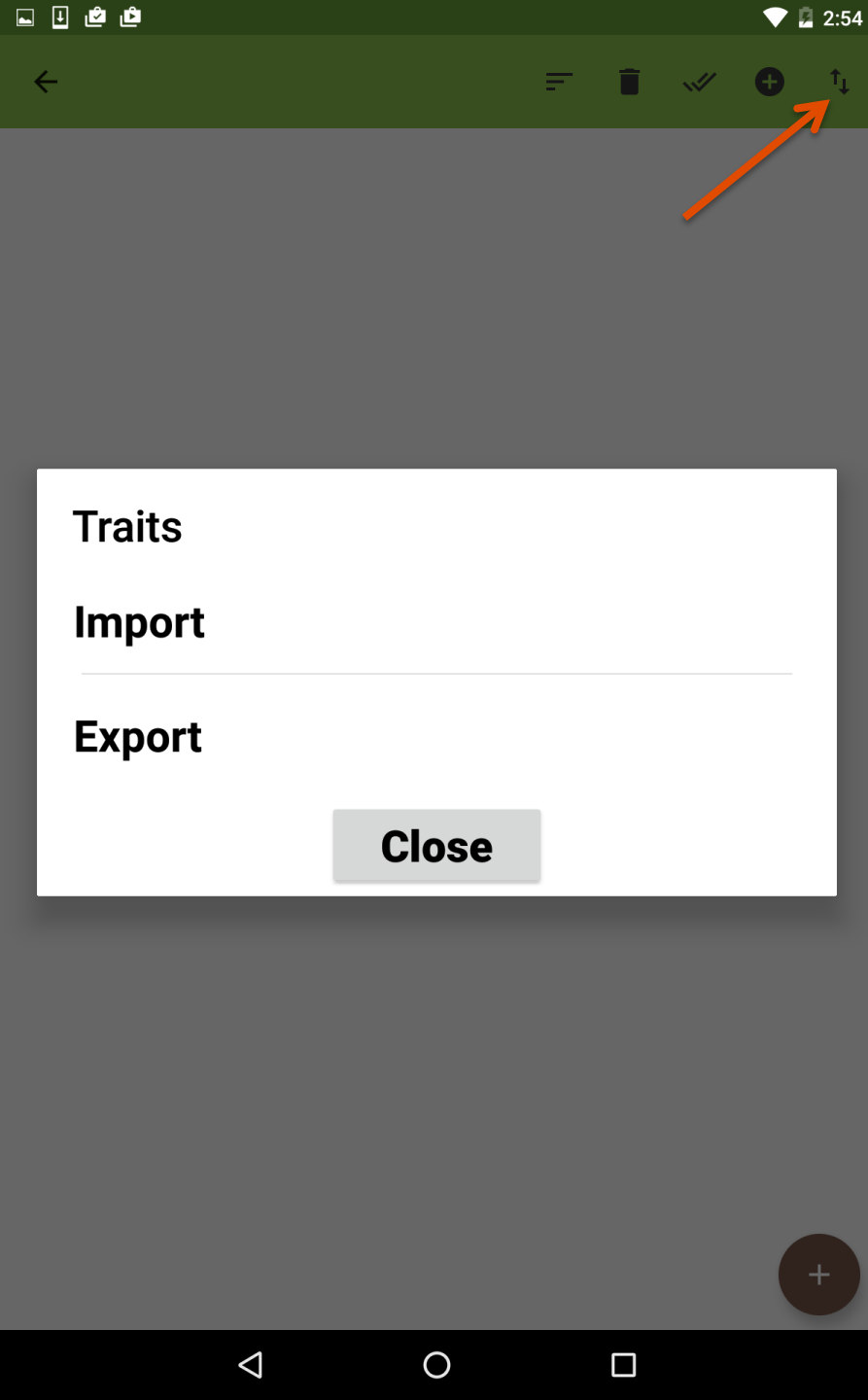
Section 3: Importing files to the Android Field Book

To load the T3 traits:

- Select "Traits" from the settings menu
- Select the ⬆⬇ symbol in the top right corner of the traits screen
- Choose to "Import" traits
- Select the relevant T3 trait file when prompted
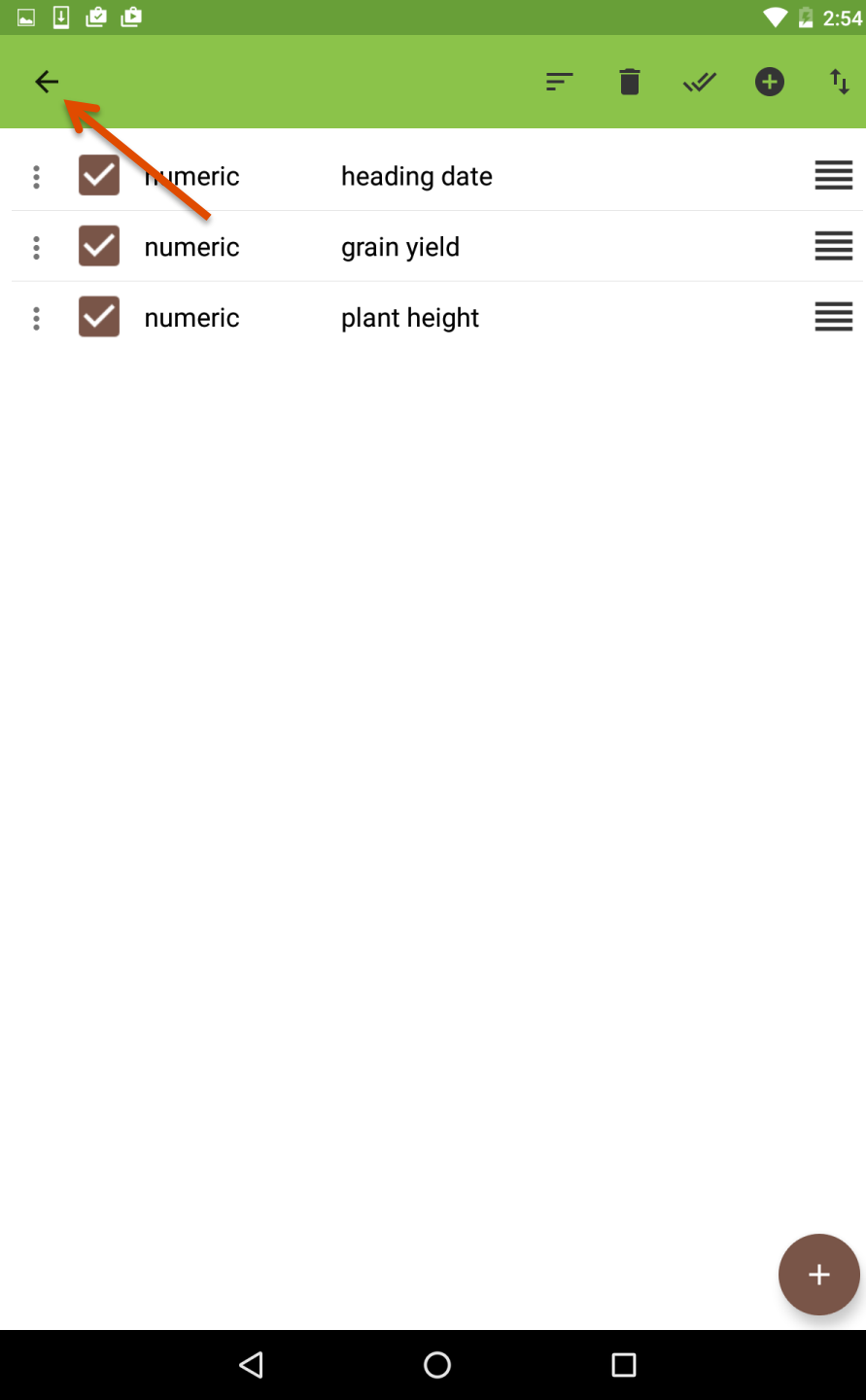
Section 3: Importing files to the Android Field Book

The traits from the T3 trait import file should now be displayed in the trait window of the AFB app

- Click the back arrow ← in the top left corner of the app to reach the settings menu again

- Select the back arrow ← again to reach the data entry screen

Section 4: Recording measurements in the Android Field Book

- The small green arrows navigate between traits
- The large black arrows navigate through the plots
- Use the keypad to record measurements
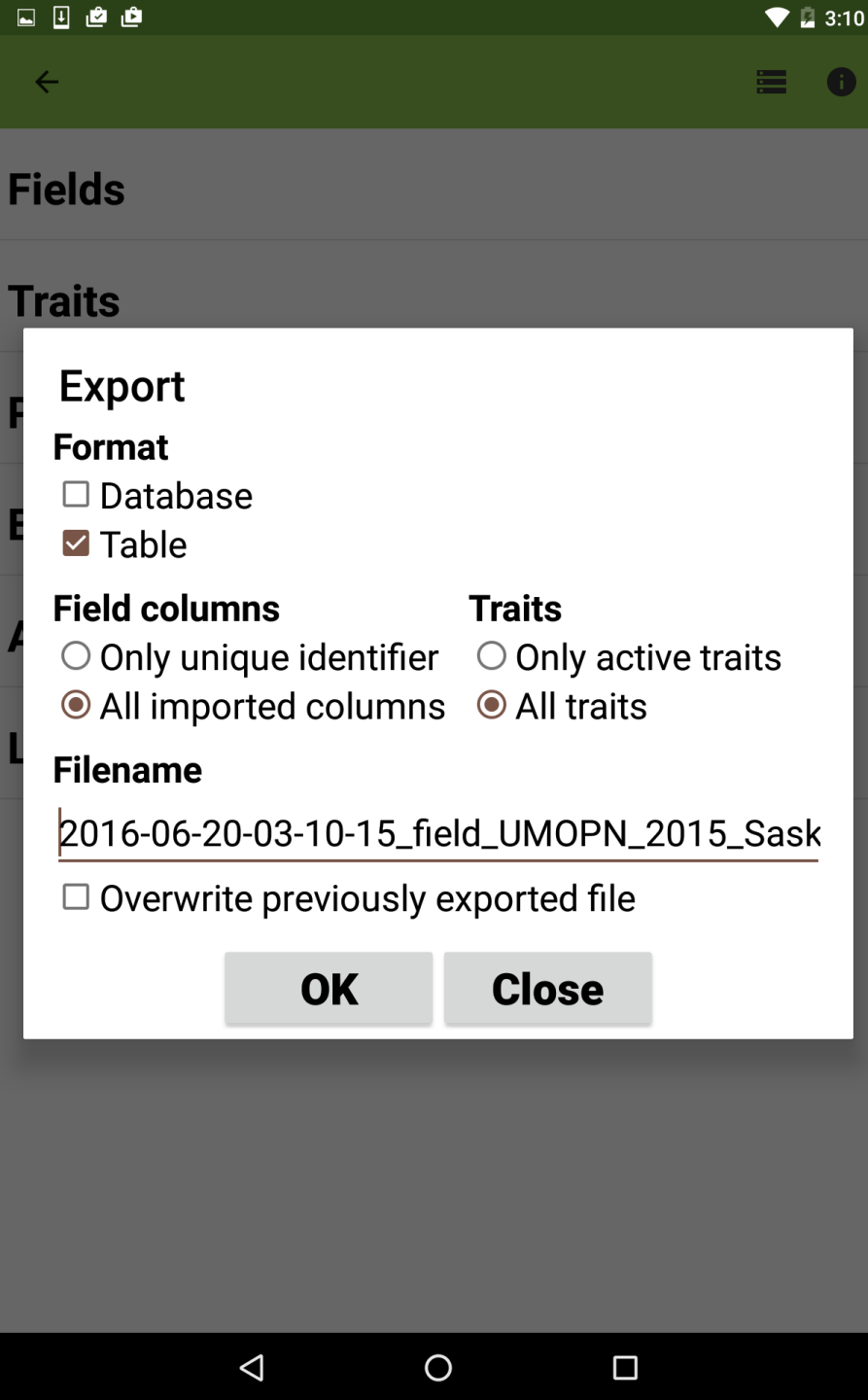
Section 5: Exporting trial results from the Android Field Book

- Navigate to the Settings menu

- Select "Export"

- Choose the "Table" format

Clicking "OK" will create a file that can be uploaded directly to T3.

Section 5: Exporting trial results from the Android Field Book

The Android File Transfer program for Mac
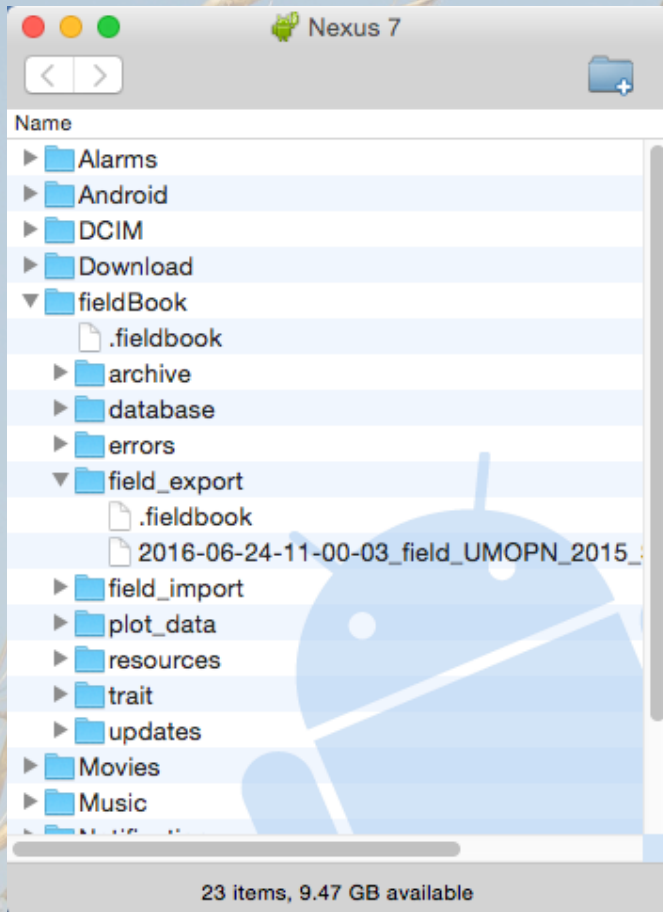
- Connect your tablet to your computer

- The exported results file will appear in the "field_export" folder within the AFB folder on your tablet

- Save the results file to your computer

The next step is to upload your results to the T3/Oat Sandbox.

Section 6: Uploading Android Field Book trial results to the T3/Oat Sandbox

- Navigate to the T3/Oat Sandbox at https://t3sandbox.org/t3/sandbox/oat/
- The curation menu will appear once you register and login
- Choose the Curate menu> Phenotype Results

Section 6: Uploading Android Field Book trial results to the T3/Oat Sandbox

Under the "Android Field Book format" heading, browse for and upload the plot-level results recorded using the AFB app.

Section 7: Submitting the Android Field Book trial to T3/Oat

You should be in possession of a:

1. Trial description file

2. Field layout file

3. Plot-level results file

The file of T3 traits does not need to be uploaded to T3.

The final step is to submit these three documents to the curator for upload to the T3/Oat database.

Section 7: Submitting the Android Field Book trial to T3/Oat

- Navigate to the Data Submission page from the About T3 menu
- Click the "Submit" button

Section 7: Submitting the Android Field Book trial to T3/Oat

Data Submission

Please submit a data file for the curator to load into the production database. File names should not contain spaces.

Data Type

- ○ **Germplasm lines**
- **Phenotyping**
  - ○ Experiment annotation
  - ○ Results
- **Genotyping**
  - ○ Experiment annotation
  - ○ Results

Comments

[   ]

This file loads successfully in the Sandbox. ○ Yes ◉ No
☐ This file contains phenotype data private to project members only.

File: [Browse…] No file selected.

[Upload]

You can submit files that do not successfully upload to the T3/Oat Sandbox to receive help from the curator

Contact Us

Please contact us if you need help using T3/Oat

Contact Us

T3/Oat

Home   Select ▾   Analyze ▾   Download ▾   Manage ▾   About T3 ▾

What's New

February 2016

Genetic Maps

An expanded oat consensus map
(50,668 markers) is now available
in addition to the Framework Oat
Consensus Map (7,202 markers)
and the 12 component maps used
to develop the consensus map.

Home: T3/Oat

Welcome to T3/Oat!

T3/Oat is the repository of oat phenotype and genotype data for the Global Oat Genetics Database, a project initiated in January 2014 by
• Gabe Gusmini (PepsiCo)
• Joe Lutz (General Mills)
• Bruce Roskens (Grain Millers)
• Nicholas Tinker (AAFC)
• Kay Simmons, Jack Okamuro, Jose Costa, Jean-Luc Jannink, and Gerard Lazo (USDA-ARS)
For more information see the Oat Global website.
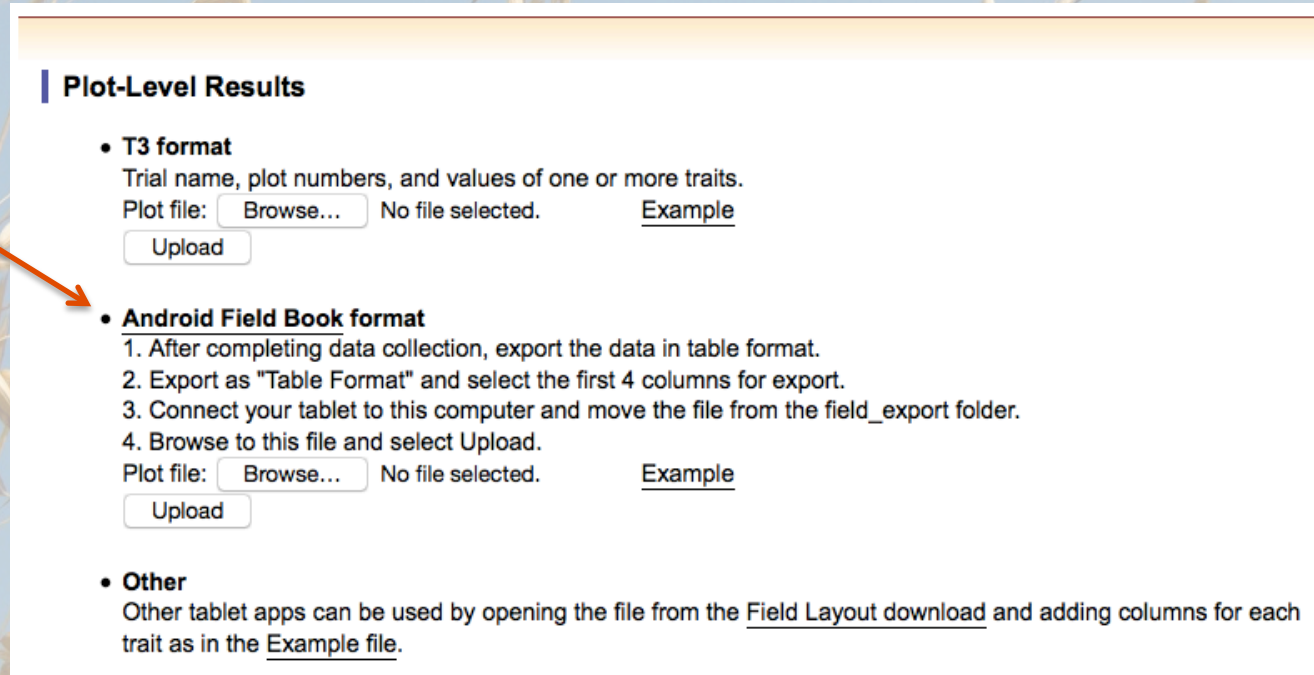
T3/Oat is built using the database schema and software developed for The Triticeae Toolbox (T3). T3 is the web portal for wheat and barley data generated by the Triticeae Coordinated Agricultural Project (T-CAP), funded by the National Institute for Food and Agriculture (NIFA) of the US Department of Agriculture (USDA). More...

Participants: The templates and instructions for data submission are here. If your data are not totally public, please check the Data Usage Policy.
Data submission